

ECOSYSTEM-BASED MANAGEMENT INDICES AND INFORMATION*Ecosystem Goal: Sustainability (for consumptive and non-consumptive uses)***Ecosystem indicators for the bottom trawl fish community of the eastern Bering Sea**

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Ecosystem-based fisheries management requires analyses beyond assessments of species that are targets of fisheries. The ICES working group on “Ecosystem Effects of Fishing Activities” has provided some ideas for developing additional ecosystem management indicators that measure more system-wide properties that might change due to fishing. Two indicators that have been found to be relatively explanatory of fishing induced changes at a more system-wide level are community size spectrum (CSS) and k-dominance curves. These indicators have been derived for several systems (Greenstreet and Hall 1996, Rice & Gislason 1996, Duplisea et al. 1997, Greenstreet et al. 1999, Bianchi et al. 2000, Zwanenburg 2000) using time series of survey information. Size spectrum involves the relationship between numbers by size interval across the sampled size range of the whole community. Some factors, such as fishing, may change the abundance of organisms of different size classes, particularly the amount of larger animals, affecting the slope of the descending limb of the size spectrum. For example, in an exploited fish assemblage, larger fish generally suffer higher fishing mortality than smaller individuals and this may be one factor causing the size distribution to become skewed toward the smaller end of the spectrum (Zwanenburg 2000), and leading to a decrease in the slope of the size relationship over time with increasing fishing pressure. Similarly, k-dominance curves, which measure the combined dominance of the k most dominant species (Lambshead et al. 1983), of disturbed communities will differ from those in unperturbed communities (Rice 2000, Bianchi et al. 2000). These indicators were derived for the eastern Bering Sea to ascertain the degree of influence fishing may have had on the characteristics of the size spectrum and k-dominance patterns and how those compare with other exploited marine systems. The k-dominance curves will be presented in the October 2004 draft.

The bottom trawl fish community appears to have fewer small individuals and more large individuals through time (Figure 138a). The slope and intercept of the CSS decreased from 1982-1987, primarily due to non-target fish. Since 2002 the both slope and intercept values have been relatively stable (Figure 138b and c). Factors other than fishing, such as the regime shift in 1988/89, may have had an influence on the community size spectrum.

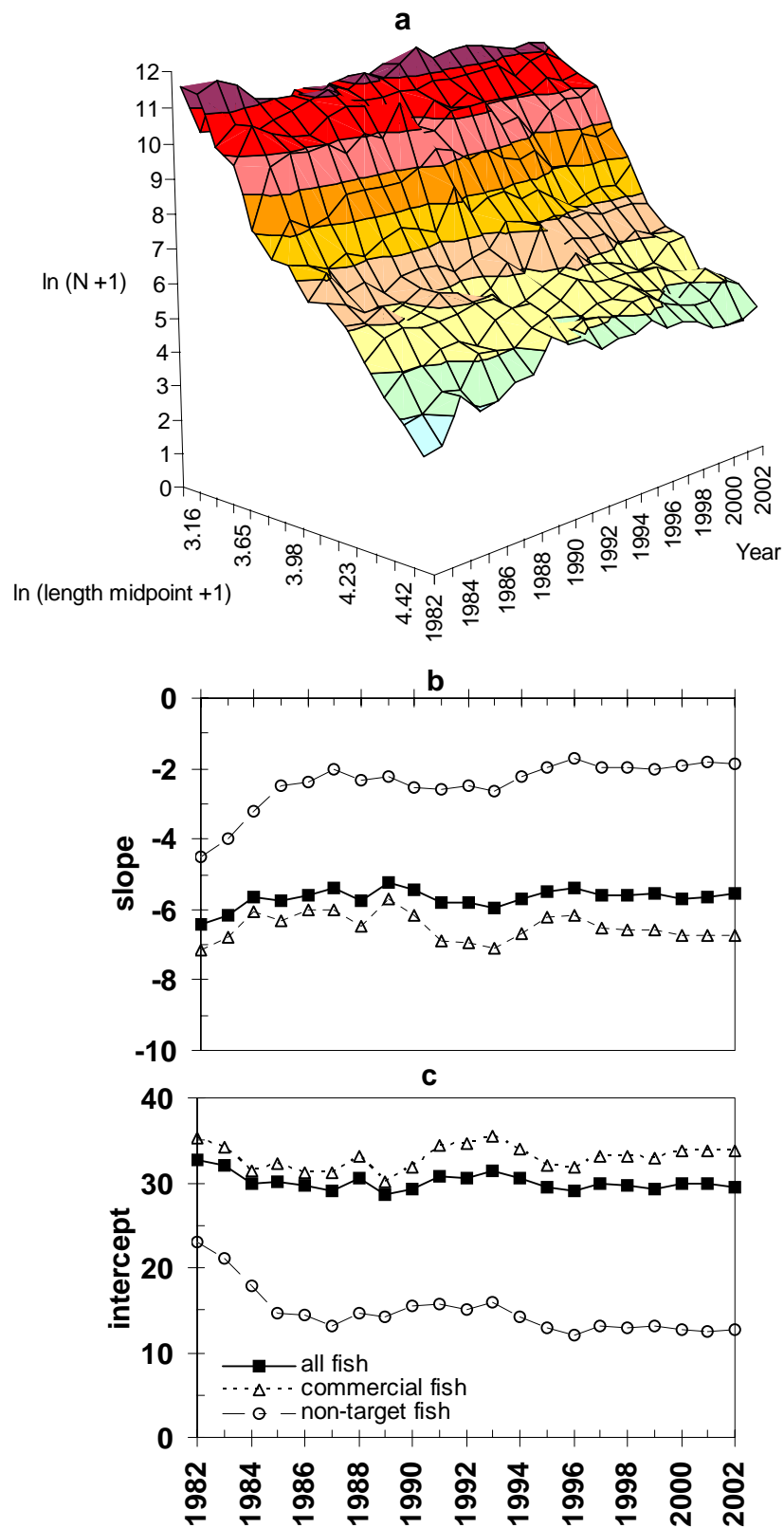


Figure 138. Eastern Bering Sea demersal fish (20-90 cm) community size spectrum (CSS), 1982-2002 (a); changes in slope (b) and intercept (c) of the CSS 1982 to 2002.